

WHAT IS CLAIMED IS:

- 1 1. A method of treating a patent foramen ovale, the method comprising:
2 advancing a catheter having a proximal end, a distal end and a closure device
3 near the distal end of the catheter into the tunnel of the patent foramen ovale; and
4 fixing the closure device within the tunnel of the patent foramen ovale.
- 1 2. A method as in claim 1, wherein fixing the closure device includes
2 passing energy into or through the closure device to cause adhesion between the closure
3 device and tissue adjacent the patent foramen ovale.
- 1 3. A method as in claim 2, wherein bipolar radiofrequency energy is used
2 to cause adhesion of the closure device to the tissue.
- 1 4. A method as in claim 2, wherein monopolar radiofrequency energy is
2 used to cause adhesion of the closure device to the tissue.
- 1 5. A method as in claim 2, wherein passing energy comprises applying
2 resistive heating, ultrasound, microwave or laser energy.
- 1 6. A method as in claim 2, wherein passing energy into or through the
2 closure device includes heating conductive particles within the closure device to cause
3 adhesion.
- 1 7. A method as in claim 2, wherein passing energy into the closure device
2 includes energizing a single conductive element of the catheter system.
- 1 8. A method as in claim 2, wherein passing energy into the closure device
2 includes energizing a multiple conductive elements of the catheter system.
- 1 9. A method as in claim 1 or claim 6, wherein fixing the closure device
2 within the patent foramen ovale tunnel includes activating tissue solder or adhesive to cause
3 the adhesion.
- 1 10. A method as in claim 9, wherein activating the tissue solder or
2 adhesive comprises rupturing solder- or adhesive-filled compartments within the closure
3 device.

1 11. A method as in claim 9, wherein tissue adhesive is infused into the
2 patent foramen ovale tunnel while energy is being applied within the tunnel.

1 12. A method as in claim 1, further comprising adhering a skirt segment of
2 the closure device to tissue surrounding a right atrial opening of the patent foramen ovale.

1 13. A method as in claim 1, wherein advancing the closure device into the
2 patent foramen ovale includes providing lateral force to the patent foramen ovale.

1 14. A method as in claim 13, wherein advancing the closure device into
2 the patent foramen ovale further includes providing dilatory force to the patent foramen
3 ovale.

1 15. A method as in claim 1, wherein advancing the closure device into the
2 patent foramen ovale includes engaging a positive stop to the periphery of the patent foramen
3 ovale to control depth penetration of the treatment apparatus and/or closure device into the
4 patent foramen ovale.

1 16. A method as in claim 1, claim 14 or claim 15, wherein advancing the
2 closure device into the patent foramen ovale further includes allowing the closure device to
3 expand within the patent foramen ovale prior to or during fixation.

1 17. A method as in claim 1, wherein advancing the closure device through
2 the patent foramen ovale includes engaging a backstop member with a left atrial side of the
3 patent foramen ovale to enhance fixation of the closure device.

1 18. A method of treating a patent foramen ovale, the method comprising:
2 advancing a catheter having a proximal end, a distal end and a closure device
3 near the distal end of the catheter into the tunnel of the patent foramen ovale; and
4 applying energy to the closure device to cause adhesion between the closure
5 device and tissue adjacent the patent foramen ovale, thereby fixing the closure device within
6 the tunnel of the patent foramen ovale.

1 19. A method as in claim 18, wherein bipolar radiofrequency energy is
2 used to cause adhesion of the closure device to the tissue.

1 20. A method as in claim 18, wherein monopolar radiofrequency energy is
2 used to cause adhesion of the closure device to the tissue.

1 21. A method as is claim 18, wherein applying energy to the closure
2 device comprises applying energy to at least one bioresorbable matrix.

1 22. A method as is claim 18, wherein applying energy to the closure
2 device comprises applying energy to at least one non-resorbable patch.

1 23. A method as in claim 22, wherein the energy is applied to a patch
2 comprising at least one of a tissue adhesive and a tissue solder.

1 24. A method of treating a patent foramen ovale, the method comprising:
2 advancing a catheter having a proximal end, a distal end and a closure device
3 near the distal end of the catheter adjacent the tunnel of the patent foramen ovale;
4 exposing at least one conducting element from the catheter;
5 advancing the conducting element into the patent foramen ovale; and
6 applying energy to the closure device to cause adhesion between the closure
7 device and tissue adjacent the patent foramen ovale, thereby fixing the closure device within
8 the tunnel of the patent foramen ovale.

1 25. Apparatus for treating a patent foramen ovale, the apparatus
2 comprising:
3 an elongate catheter having a proximal end and a distal end; and
4 at least one closure device releasably coupled with the catheter near the distal
5 end, wherein the closure device may be fixedly deployed within the tunnel of the patent
6 foramen ovale.

1 26. Apparatus as in claim 25, wherein no part of the at least one closure
2 device extends into the left atrium.

1 27. Apparatus as in claim 25, wherein the at least one closure device
2 comprises a bioresorbable matrix.

1 28. Apparatus as in claim 25, wherein the at least one closure device
2 comprises a non-resorbable patch.

1 29. Apparatus as in claim 25, further including at least one backstop
2 member coupled with the catheter for engaging left atrial tissue adjacent the patent foramen
3 ovale to enhance positioning of the patch within the tunnel.

1 30. Apparatus as in claim 25, further including at least one expandable
2 balloon member for deploying the patch within the tunnel.

1 31. Apparatus as in claim 25, wherein the at least one closure device is
2 doped with materials which aid in conduction or reduce resistance or impedance.

1 32. Apparatus as in claim 31, wherein the doped materials form specific
2 pathways of increased conduction, or reduced resistance or impedance.

1 33. Apparatus as in claim 31 or claim 32, wherein the doping materials are
2 selected from the group consisting of gold, platinum, iridium, tantalum, tungsten, sodium
3 chloride, alloys or combinations thereof, and resorbable metals such as iron and nickel alloys.

1 34. Apparatus as in claims 25, 31, 32 or 33, wherein the at least one
2 closure device further comprises at least one tissue solder or adhesive.

1 35. Apparatus as in claims 25, 31, 32 or 33, wherein the at least one
2 closure device is designed to absorb blood, the blood acting as an autologous tissue adhesive.

1 36. Apparatus as in claim 25, wherein the closure device expands to fill the
2 tunnel of the patent foramen ovale.

1 37. Apparatus as in claim 25, wherein application of energy to the closure
2 device causes the closure device to conform to geometry of the patent foramen ovale.

1 38. Apparatus as in claim 25, wherein application of energy to the closure
2 device fixes the device to tissue of the patent foramen ovale.

1 39. Apparatus as in claim 25, wherein application of energy to the closure
2 device ruptures solder- or adhesive-filled compartments within the closure device to fix the
3 device to tissue of the patent foramen ovale.

1 40. Apparatus as in claim 25, further comprising at least one energy
2 transmission member coupled with the catheter body adjacent the distal end for transmitting
3 energy to the closure device.

1 41. Apparatus as in claim 40, wherein the energy transmission member
2 transmits at least one of radiofrequency, resistive heating, ultrasound, microwave and laser
3 energy.

1 42. Apparatus for treating a patent foramen ovale, the apparatus
2 comprising:
3 an elongate catheter body having a proximal end and a distal end; and
4 at least one energy transmission member coupled with the catheter body
5 adjacent the distal end for transmitting energy to a closure device and tissue adjacent the
6 patent foramen ovale to induce closure of the patent foramen ovale.

1 43. Apparatus as in claim 42, wherein the closure device is mounted on the
2 at least one energy transmission member.

1 44. Apparatus as in claim 42, wherein the closure device spans two or
2 more energy transmission members.

1 45. Apparatus as in claim 42, wherein the energy transmission member
2 transmits at least one of radiofrequency, resistive heating, ultrasound, microwave and laser
3 energy.

1 46. Apparatus as in claim 42, wherein the at least one closure device
2 comprises a bioresorbable matrix.

1 47. Apparatus as in claim 42, wherein the at least one closure device
2 comprises a non-resorbable patch.

1 48. Apparatus as in claim 42, further including at least one backstop
2 member coupled with the catheter for engaging left atrial tissue adjacent the patent foramen
3 ovale to enhance positioning of the patch within the tunnel.

1 49. Apparatus as in claim 42, further including at least one expandable
2 balloon member for deploying the patch within the tunnel.

1 50. Apparatus as in claim 42, wherein two or more catheter elements apply
2 lateral force to the patent foramen ovale prior to and/or during closure.

1 51. Apparatus as in claim 50, wherein the two or more catheter elements
2 further apply dilatory forces to the patent foramen ovale prior to and/or during closure.

1 52. Apparatus as in claim 42, wherein transmission of energy to the
2 closure device activates a tissue solder or tissue adhesive to cause fixation of the closure
3 device to tissue of the patent foramen ovale.

1 53. Apparatus as in claim 42, wherein the at least one energy transmission
2 member transmits energy through a conductive or low resistance/impedance plane or
3 pathway of the closure device.